भारतीय मानक **IS 5428 (Part 4) : 2023**

Indian Standard

गेज ग्लास — विशिष्टि

भाग 4 वृत्ताकार लक्षक और हल्के ग्लास

(दूसरा पुनरीक्षण)

Gauge Glasses — Specification

Part 4 Circular Sight and Light Glasses

(Second Revision)

ICS 17.040.30

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September 2023 **Price Group 6**

Chemical Engineering Plants and Related Equipment Sectional Committee, MED 17

FOREWORD

This Indian Standard (Part 4) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Chemical Engineering Plants and Related Equipment Sectional Committee had been approved by the Mechanical Engineering Divisional Council.

This standard was first published in 1969 in two parts and then revised in 1985. The present revision has been taken up with a view to incorporate the modification found necessary as a result of experience gained in the use of this standard. Also, in this revision, the standard has been brought into the latest style and format of Indian Standards, and references to Indian Standards, wherever applicable have been updated. BIS certification marking clause has been modified to align with the revised *Bureau of Indian Standards Act,* 2016.

This standard on gauge glass, Part 4 Circular sight and light glasses is one of the series of standards on gauge glasses. Other parts of this standard are:

Part 1 Tubular glasses for level gauges
Part 2 Protector glasses for tubular gauge glasses
Part 3 Through-vision and reflex glasses
Part 5 Port gauge glasses as used in fittings for steam boilers

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

GAUGE GLASSES — SPECIFICATION

PART 4 CIRCULAR SIGHT AND LIGHT GLASSES

(Second Revision)

1 SCOPE

This standard (Part 4) covers the requirements for circular sight and light glasses.

2 REFERENCES

The standard given below contains provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of this standard:

IS No.	*Title*
IS 5428 (Part 1) : 1985	Specification for gauge glasses: Part 1 Tubular glasses for level gauges (*first revision*)

3 DEFINITIONS

For the definition of various terms used in the glass industry, refer to **2** of IS 5428 (Part 1).

4 MATERIAL

4.1 Circular sight and light glasses shall be made of soda-lime glass or borosilicate glass, either annealed or toughened, as required.

4.2 Circular sight and light glasses shall be free from defects that would interfere with vision or service, in particular, both faces shall be free from irregularities within the area required for jointing.

4.3 The following properties shall be decided between purchaser and manufacturer depending on working conditions and shall be specified along with requisitions:

a) Chemical resistance to water, acid and alkalies with some minimum limits;
b) Average coefficient of thermal expansion;
c) Chemical composition of glass; and
d) Tensile and bending strength at ambient and maximum operating temperature.

5 DIMENSIONS

5.1 The preferred diameters of circular sight and light glasses shall be 50 mm, 65 mm, 75 mm, 100 mm, 125 mm, 150 mm, 175 mm and 200 mm for which the tolerance shall be ± 1 mm and 255 mm and 305 mm, for which the tolerance shall be $^{+1}_{-2}$ mm.

5.2 The preferred thicknesses and appropriate tolerances of circular sight and light glasses shall be as given in Table 1.

Table 1 Preferred Thickness of Circular Sight and Light Glasses

(*Clause* 5.2 *and* 5.5)

Sl No. (1)	**Soda-Lime Glass** mm (2)	**Borosilicate Glass** mm (3)
i)	06 ± 0.2	06.35 ± 0.8 (nominally 06)
ii)	10 ± 0.3	09.53 ± 1.6 (nominally 10)
iii)	12 ± 0.3	12.70 ± 1.6 (nominally 12)
iv)	15 ± 0.5	15.70 ± 1.6 (nominally 15)
v)	19 ± 1.0	19.00 ± 1.6 (nominally 19)
vi)	25 ± 2.0	24.40 ± 2.4 (nominally 25)

5.3 Other dimensions and tolerances as agreed to between the purchaser and the vendor are permitted within this standard, provided that the glasses comply with the other clauses of the specification.

5.4 Classes shall be flat (that is free from bow) within the limits specified in Table 2.

5.5 When glasses are required with thicknesses other than those given in Table 1, or diameters outside the range given in **5.1**, the limits of bow shall be as given in Table 2 for the next size smaller and next size thinner in the same material.

6 FINISH OF EDGES

All glasses including cut and moulded glasses shall be radiused or arrised to remove sharp corners; edges of cut glasses shall be ground smooth.

7 TESTS

7.1 Inspection Under Polarized Light

Each toughened circular sight and light glass shall be examined under polarized light. Any glass which does not show a polarization pattern indicative of toughening shall be rejected. Hoop stress as seen by rotation of the glass in the strain viewer shall be of similar intensity around the complete periphery and shall not be interrupted by the incidence of surface cracks, heavy cord, or other defects.

7.2 Thermal Shock Requirements

Manufacturers shall certify that toughened circular sight and light glasses shall pass the thermal shock test and acceptance conditions as given in IS 5428 (Part 1). The glass shall enter the water bath with an observation face parallel to the water surface.

7.3 Hydrostatic Test

The assembly shall be hydro tested at a minimum pressure of 1.5 × operating pressure × allowable stress of glass at ambient temperature/allowable stress of glass at operating temperature.

8 DESIGNATION

The designation of a circular sight glass of diameter 100 mm and thickness 15 mm shall be:

Sight glass 100 × 15 IS 5428 (Part 4)

9 SAMPLING

Two percent of the glasses (but not less than 10 or more than 30 glasses) shall be taken by random selection from each consignment. If more than 10 percent but not more than 20 percent of the glasses in the sample fail the test, a further sample of 2 percent shall be taken by random selection from the consignment and subjected to a second test. If annealed glasses are required to be tested for resistance to thermal shock, the temperature difference for the tests shall be as agreed to between the purchaser and the manufacturer. Glasses subjected to and passing the test may be put into service.

10 MARKING

10.1 The circular sight and light glasses shall be permanently marked with the following:

a) Manufacturer’s identification or trade-mark; and
b) The size of the circular sight and light glass.

10.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

11 PACKING

The glasses shall be packed securely in suitable inner boxes, containing not more than 24 glasses and adequately cased for transit.

Table 2 Limits of Bow for Circular Sight and Light Glass

(*Clause* 5.4 *and* 5.5)

All dimensions in millimetres.

Sl No. (1)	Material (2)	50 to 100 (3)	101 to 150 (4)	151 to 200 (5)	201 to 300 (6)
i)	Annealed glass (all thicknesses)	0.05	0.08	0.10	0.13
ii)	Toughened glass up to 12 mm thickness	0.13	0.25	0.38	0.64
iii)	Toughened glass above 12 mm and up to 25 mm thickness	0.10	0.20	0.25	0.38

ANNEX A

(*Informative*)

RECOMMENDATIONS ON GLASSES

A-1 Circular sight and light glasses are not recommended for greater maximum working temperature and temperature differentials (ambient to fluid) than those given below. These figures have been adjusted so that they apply to the differential between the ambient and fluid temperatures, because of the impracticability of measuring actual glass surface temperatures under operational condition. The temperatures stated, however, ensure that, within the conditions covered by this standard the glasses will not be overstressed.

Sl No.	*Recommended Maximum Working Temperatures and Temperature Differentials for Through-Vision and Reflex Glasses and Circular Sight and Light Glass*		
	Type of Glass	Maximum Working Temperature °C	Maximum Temperature Differential (Ambient to Fluid) °C
(1)	(2)	(3)	(4)
i)	Annealed soda-lime	350	40
ii)	Toughened soda-lime	300	265
iii)	Annealed borosilicate	400	110
iv)	Toughened borosilicate	360	265

A-2 RECOMMENDED MAXIMUM PRESSURE FOR CIRCULAR SIGHT AND LIGHT GLASSES

Circular sight and light glasses are not recommended for pressures greater than those indicated in Fig. 1 to 4. The range of application of these graphs should be considered as limited to the largest preferred glass diameter 305 mm and greatest preferred thickness 25 mm of the circular sight and light glasses covered in this standard. For applications outside these limits, the manufacturer should be consulted.

A-3 CORROSION

Corrosion of glass on pressure vessels is sometimes a problem requiring consideration, because of the faster rate of chemical reactions at temperatures and pressure above atmospheric. Borosilicate glass is more resistant than soda-lime glass. For use under severe conditions, for instance in the presence of alkalies where the consequences of failure would be serious, the use of two glasses (each capable of withstanding the full pressure) is to be preferred. In boiler practice, the glass is frequently protected by mica, alternatively, corrosion may be minimized by control of the fluid circulation. The glass manufacturer should be consulted regarding the possible effect of corrosion on the properties of glass for pressure vessels wherever particularly adverse conditions are likely to be encountered.

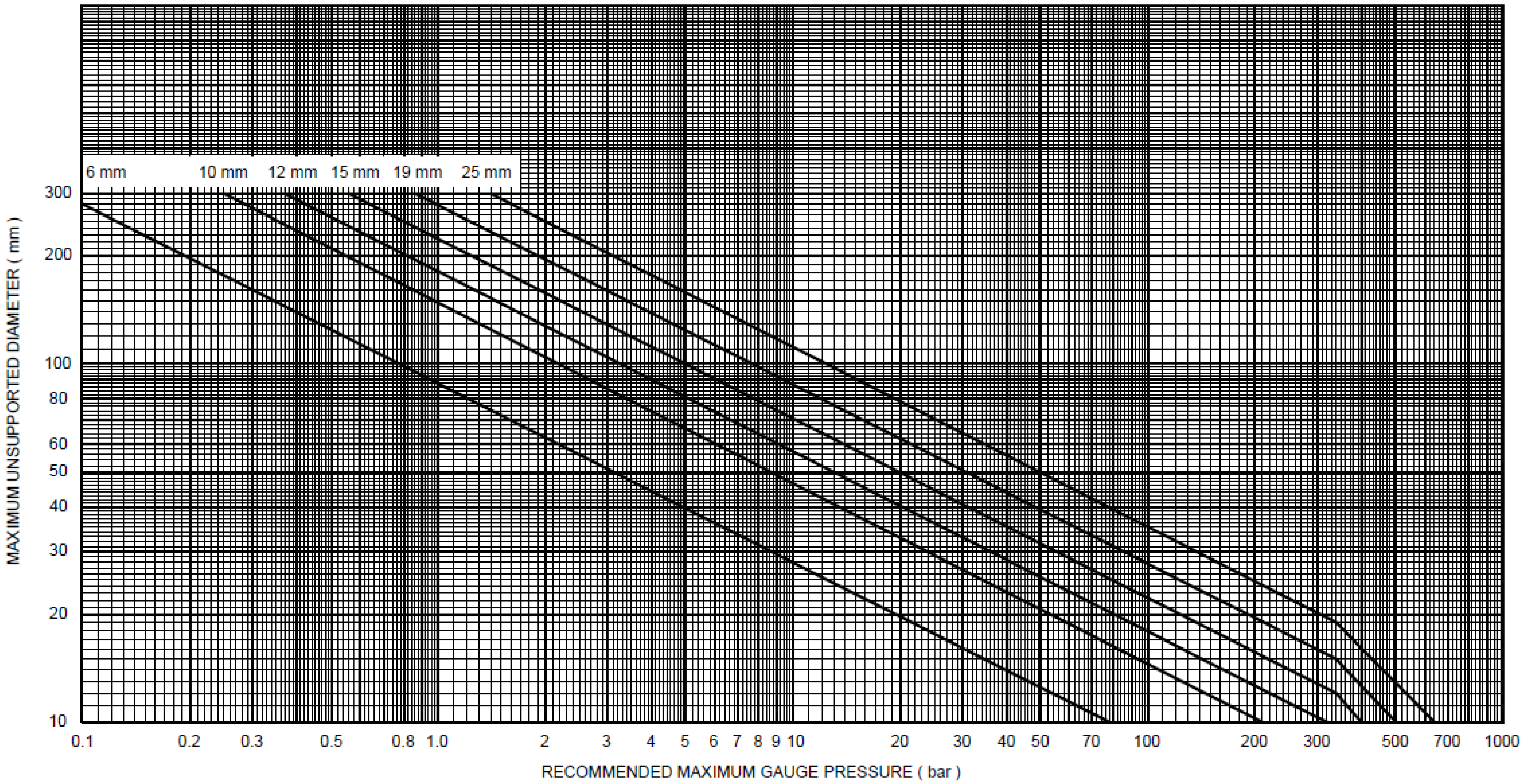

FIG. 1 ANNEALED SODA-LIME GLASS (DESIGN BENDING STRESS 7 MN/m^2)

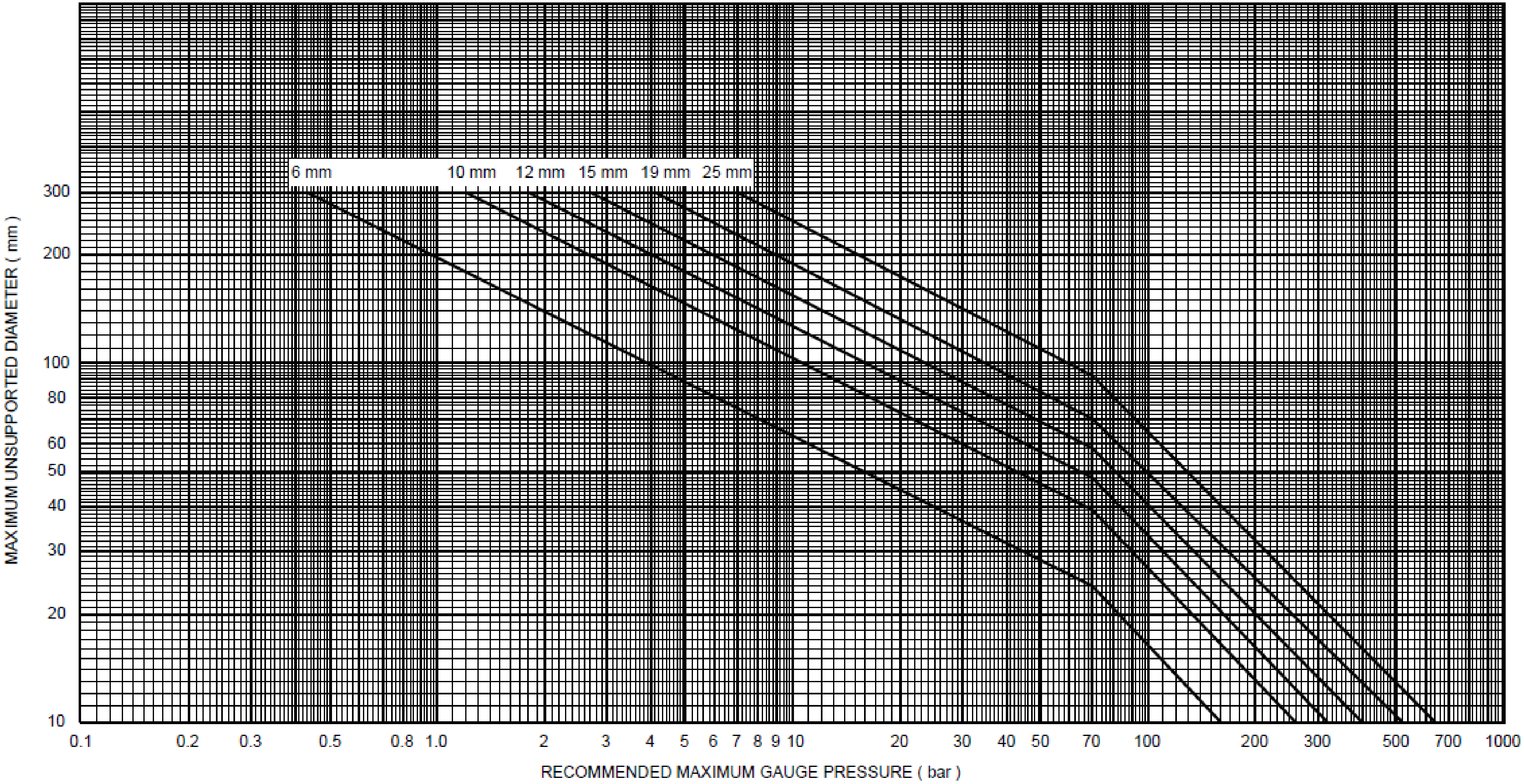

FIG. 2 TOUGHENED SODA-LIME GLASS (DESIGN BENDING STRESS 35 MN/m^2)

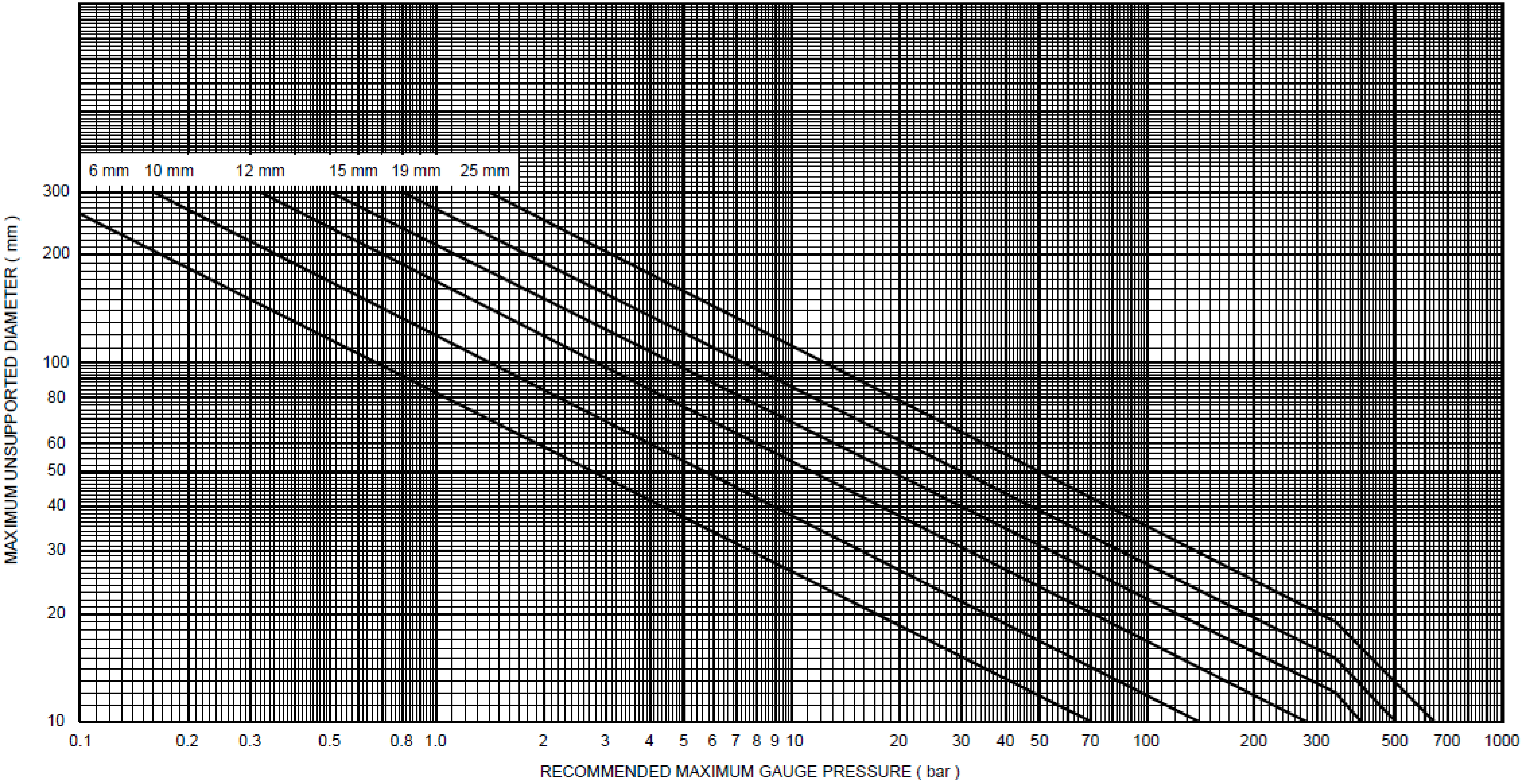

FIG. 3 ANNEALED BOROSILICATE GLASS (DESIGN BENDING STRESS 7 MN/m^2)

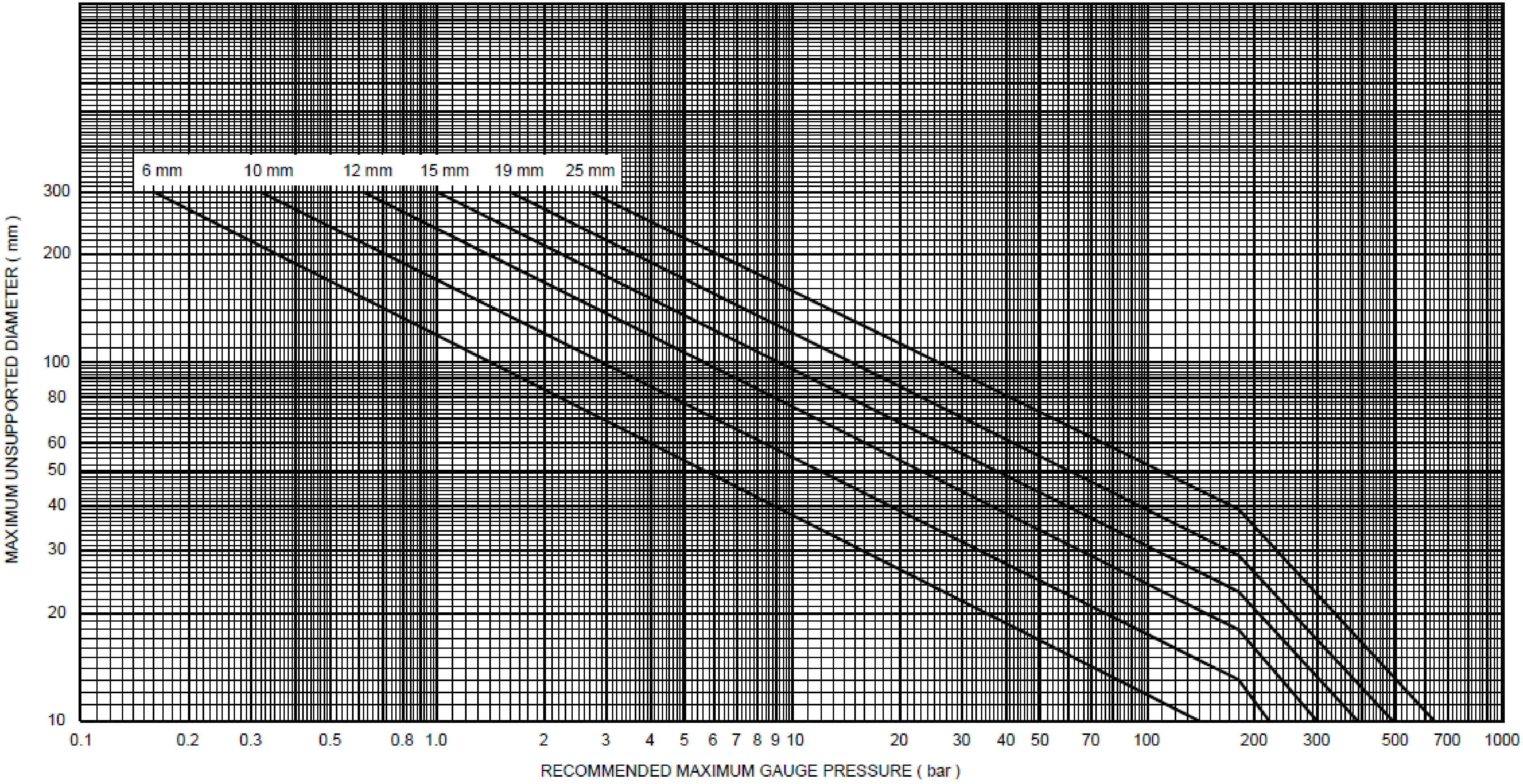

FIG. 4 TOUGHENED BOROSILICATE GLASS (DESIGN BENDING STRESS 14 MN/m^2)

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Chemical Engineering Plants and Related Equipment Sectional Committee, MED 17

Organization	*Representative(s)*
CSIR - Indian Institute of Petroleum, Dehradun	Dr Mritunjay Kumar Shukla **(*Chairperson*)**
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